

**A REVISION OF THE GENUS *HYPSOROPHA* HÜBNER
(LEPIDOPTERA: NOCTUIDAE: OPHIDERINAE)**

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Abstract.—The genus *Hypsoropha* (Lepidoptera: Noctuidae) is revised and two new species, *H. franclemonti*, and *H. baja* are described. Male and female genitalia and adult habitus are illustrated for all known species in the genus. Character states and resulting cladogram are presented.

Hypsoropha Hübner (Lepidoptera: Noctuidae: Ophiderinae) is a genus known from Middle and North America. Two of the included species, *H. monilis* Fabricius (1777) and *H. hormos* Hübner (1818) are common in the southeastern United States. *Hypsoropha adeona* Druce (1889) was described from Mexico and has recently been recorded from Costa Rica by Daniel H. Janzen (in collection of J. G. Franclemont and USNM). A fourth species is herein recorded from Cuba and the Bahamas and a fifth from Mexico and Arizona. The only other species previously associated with the genus, *Tiauspa* [*Hypsoropha*] *argyria* Butler (1879), was transferred from the Noctuidae and made the type of a notodontid genus, *Ctianopha*, by Schaus (1901).

Both *Hypsoropha monilis* and *H. hormos* range over most of the southeastern United States with *H. hormos* being the most widespread, having been reported as far west as Arizona (Forbes, 1954), and as far north as New Hampshire and New York (Crumb, 1956). *Hypsoropha hormos* larvae feed on Persimmon (*Diospyros virginiana* L.) [Ebenaceae] (Dyar, 1899; Glover, 1878; Gueneé, 1852) and Sassafras (*Sassafras albidum* (Nutt.) Nees [Lauraceae] (Forbes, 1954). *H. monilis* larvae have been reported from *Diospyros* (Crumb, 1956) and I have seen larvae (Fig. 29) from New Jersey on *D. virginiana*.

Hypsoropha Hübner, 1818

Type species: *Noctua monilis* Fabricius by subsequent designation by Grote, 1874.
Gloee Hübner, 1808, suppressed (ICZN Op. 789).

Type species: *Gloee monilis sensu* Hübner by subsequent designation by Berio, 1957.

Euphais Hübner, 1818.

Type species: *Noctua monilis* Fabricius by subsequent designation by Berio, 1957.

Monogona Gueneé, 1852.

Type species: *Hypsoropha hormos*, by monotypy.

Tiauspa Walker, 1858.

Type species: *Hypsoropha hormos*, by monotypy.

Gloce Neave, 1939, misspelling.

Description: Palpus upturned beyond vertex in males; male antenna pectinate to subpectinate, female antenna filiform; eyes naked; reniform inconspicuous or absent; orbicular a black point; forewing apex slightly falcate; female possessing appendix bursa.

Hypsoropha's monophyly is established by the following synapomorphies: forewing with a transverse series of about four circular white markings in the fold along the postmedian line; 8th abdominal sternum in the male with a peculiar pincer-like development.

The nearest relatives appear to belong to the genus *Psammathodoxa* as suggested by Franclemont (1985). *Psammathodoxa* and *Hypsoropha* share a chitinized development of the eighth abdominal sternum, although this has become much more elaborate in the latter.

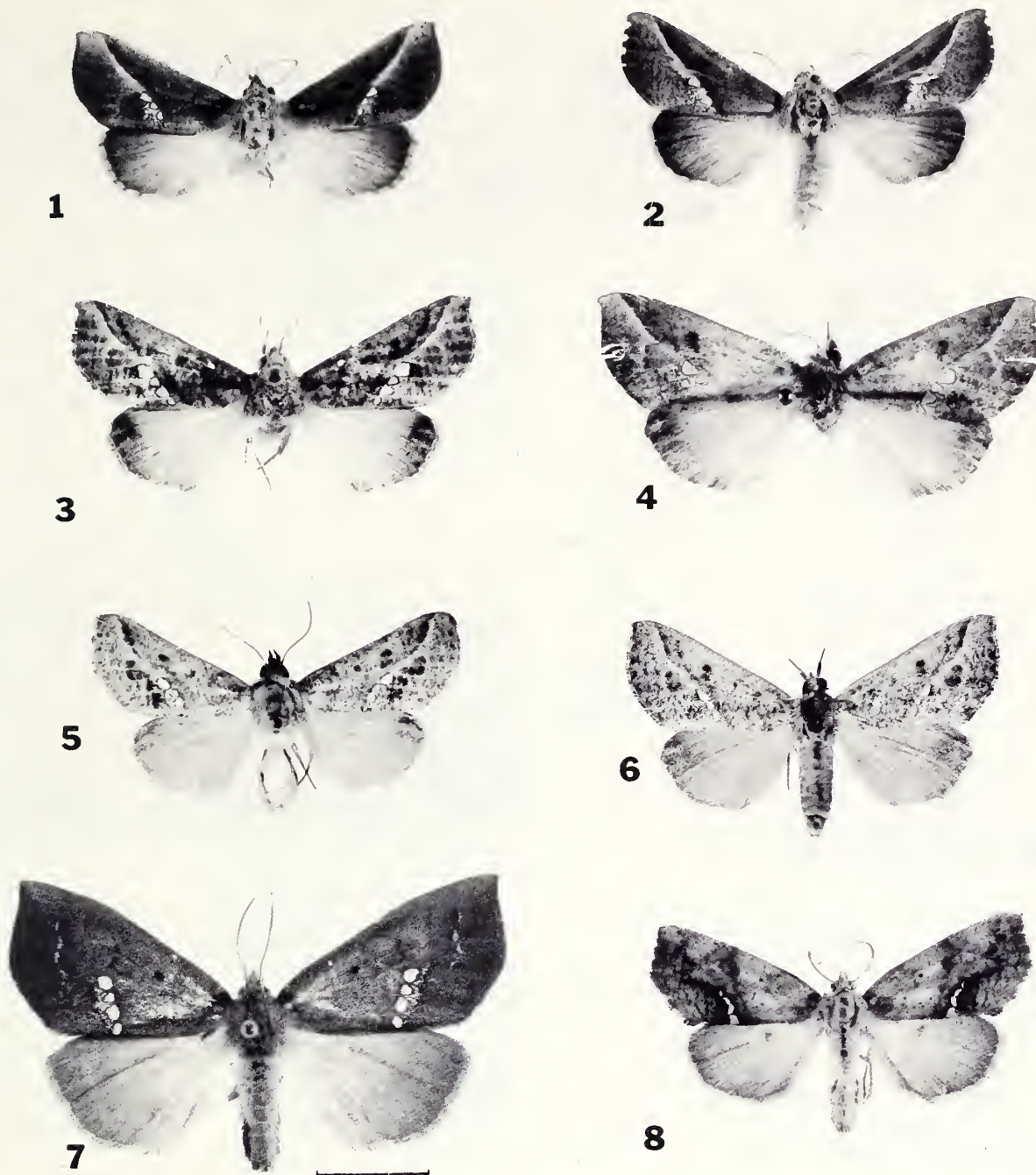
***Hypsoropha franclemonti*, new species**

Description. Antenna pectinate in male, simple in female; palpus upturned beyond vertex in male, to middle of front in female; head, tegula and thorax violet-gray; forewing with even, oblique postmedian line starting as four white markings in fold and terminating at costa near apex; antemedian line, when traceable, bowed out at middle; reniform obscure, orbicular a black point; wings silvery gray with diffuse whitish scaling along posterior margin and at apex; hindwing buff from base to middle, gradually darkening toward margin; fringe white. Male genitalia and eighth sternite as in Figures 10 and 12. Female genitalia as in Figure 9. Expanse 25–34 mm.

Diagnosis. *H. franclemonti* can be distinguished from *H. monilis* and *H. hormos* by the even, oblique postmedian line; from *H. adeona* and *H. baja* by the buff-gray hindwing and less mottled forewing. The female bursa copulatrix has one band of signa in *H. franclemonti* versus two bands in *H. adeona*. Other structural differences in genitalia are evident from the illustrations (compare Figs. 9–12, 13–16, and 25–28). *Hypsoropha franclemonti* is presently known only from Cuba and Great Exuma Island in the Bahamas. *Diospyros crassinervis* (Krug & Urb.) Standl. has been reported in Cuba as well as in the Bahamas (Correll and Correll, 1982) and may prove to be an acceptable food plant for the new species.

Type material. **BAHAMAS**, **Holotype** male: Great Exuma Island, Simon's Point, lat 23.31.50 long. 75.47.30, 11 April 1986, T. L. McCabe [NYSM]; **Paratypes**, 17: **CUBA** (2) Santiago (no additional data) [USNM, BMNH]; and the **BAHAMAS** (14) (same data as Holotype except dates run from 10–16 April 1986) [NYSM, LACM, JGF]; Bahamas: J. M. St. J. Yates (no additional data) (1) [BMNH]. Paratypes will be deposited in the USNM, the BMNH, the LACM, and the collection of J. G. Franclemont.

It gives me great pleasure to name this species after Prof. John G. Franclemont. I have benefitted greatly from his frequent counsel. It seems especially fitting to commemorate him with a species in a group for which a connection had been made through his knowledge and insight.

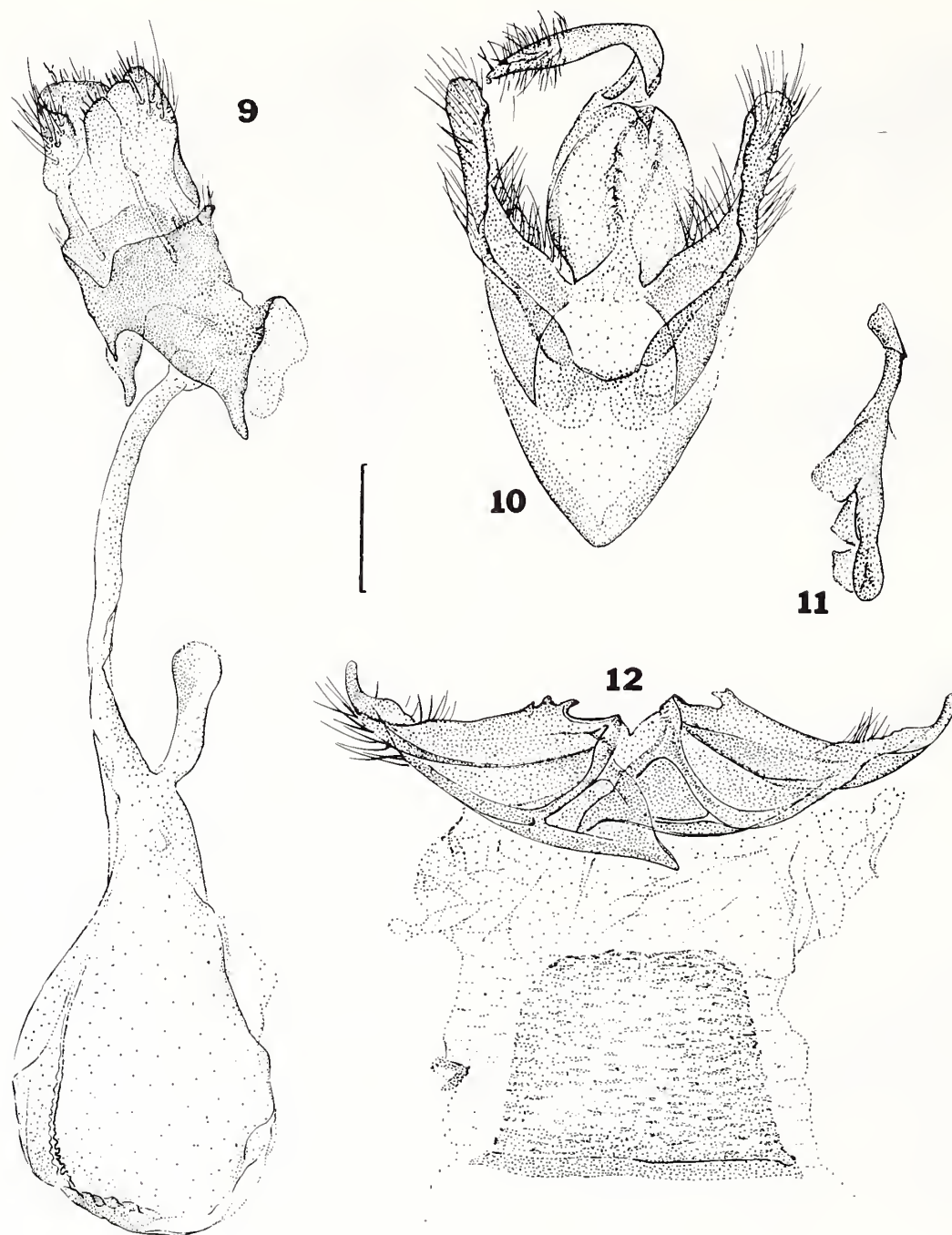


Figs. 1–8. 1. *Hypsoropha franclemonti*, Holotype male, Bahamas, 15 April 1986. 2. *H. franclemonti*, Paratype female, same data. 3. *H. adeona*, male, Guanacoste, Costa Rica. 4. *H. adeona*, female, Veracruz, Mexico. 5. *H. baja*, Holotype male, Baja California, 10–11 Sept. 1984. 6. *H. baja*, Paratype female, same locale, 9 Sept. 1984. 7. *H. monilis*, male, Liberty Co., Florida, 25 March 1983. 8. *H. hormos*, male, Alachua Co., Florida, 3 April 1986. Scale line 10 mm.

***Hypsoropha baja*, new species**

Figs. 5, 6, 25–28

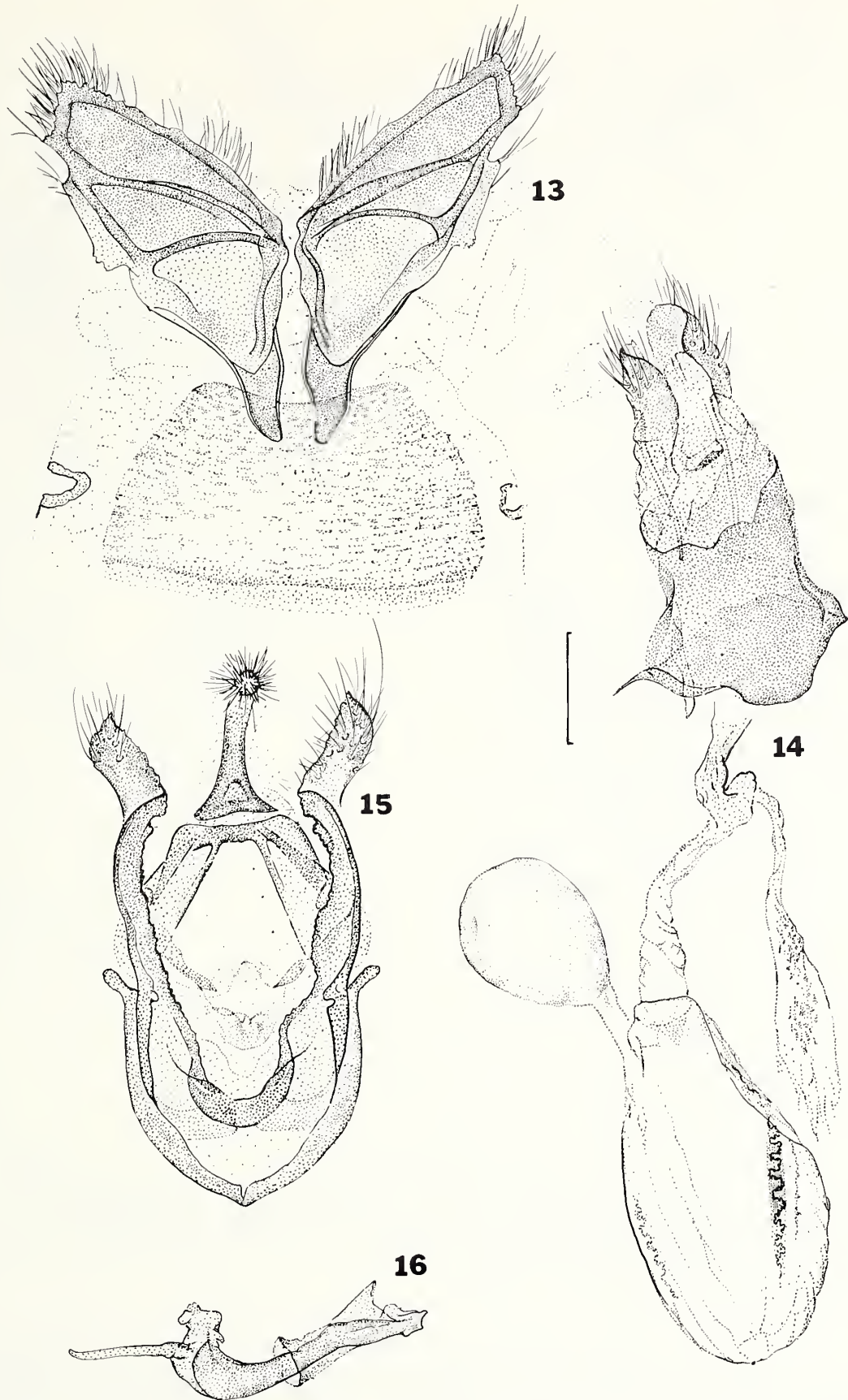
Description. Antenna pectinate in male, simple in female; palpus upturned beyond vertex in male, to middle of front in female; head, tegula and thorax violet-gray; forewing with even, oblique postmedian line starting as four white markings in fold and terminating at costa near apex; antemedian line, when traceable, bowed out at



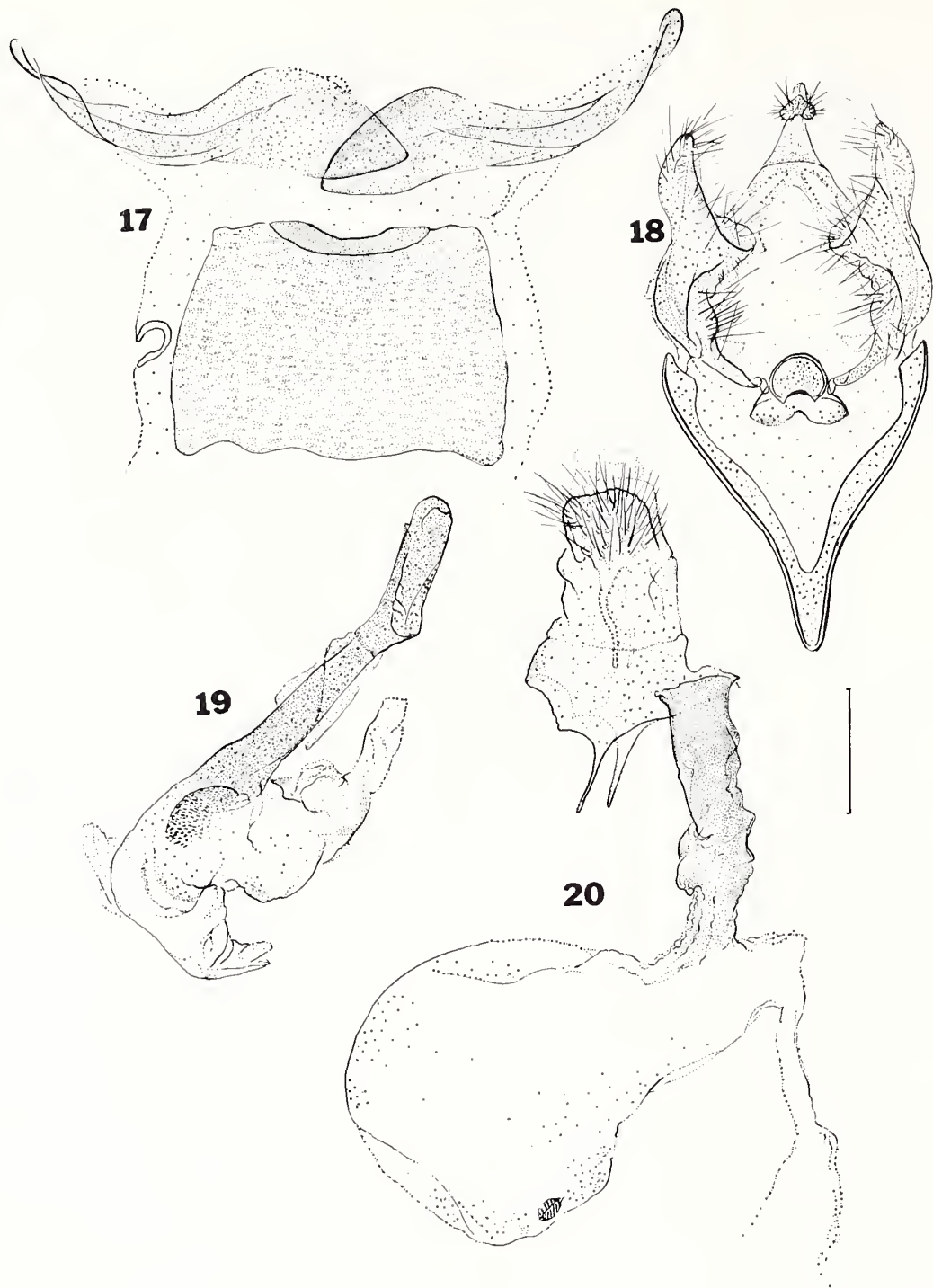
Figs. 9–12. *Hypsoropha franclemonti*. 9. Female genitalia (ventral view), McCabe slide 1499, Bahamas, 10 April 1986. 10. Male genitalia, McCabe slide 1497, Bahamas. 11. Aedoeagus with vesica uneverted, McCabe slide 1497, Bahamas. 12. Seventh and eighth abdominal sterna, McCabe slide 1497, Bahamas. Scale line 1 mm.

middle; reniform obscure, orbicular a black point; wings brownish gray with diffuse whitish scaling at apex, heavily mottled; hindwing buff from base to middle, slight darkening toward margin; fringe white. Male genitalia and eighth sternum as in Figures 26–28. Female genitalia as in Figure 25. Expanse 29–35 mm.

Diagnosis. *H. baja* can be distinguished from *H. franclemonti* by the more irrorated forewings and male eighth sternites that lack teeth, and from *H. adeona* by the smaller size and gray hindwings (creamy in *H. adeona*). *H. baja* has a variable am line (absent to well represented whereupon it is dentate across from cell) and a variable amount of freckling (almost smooth in one specimen). It is presently known only from the



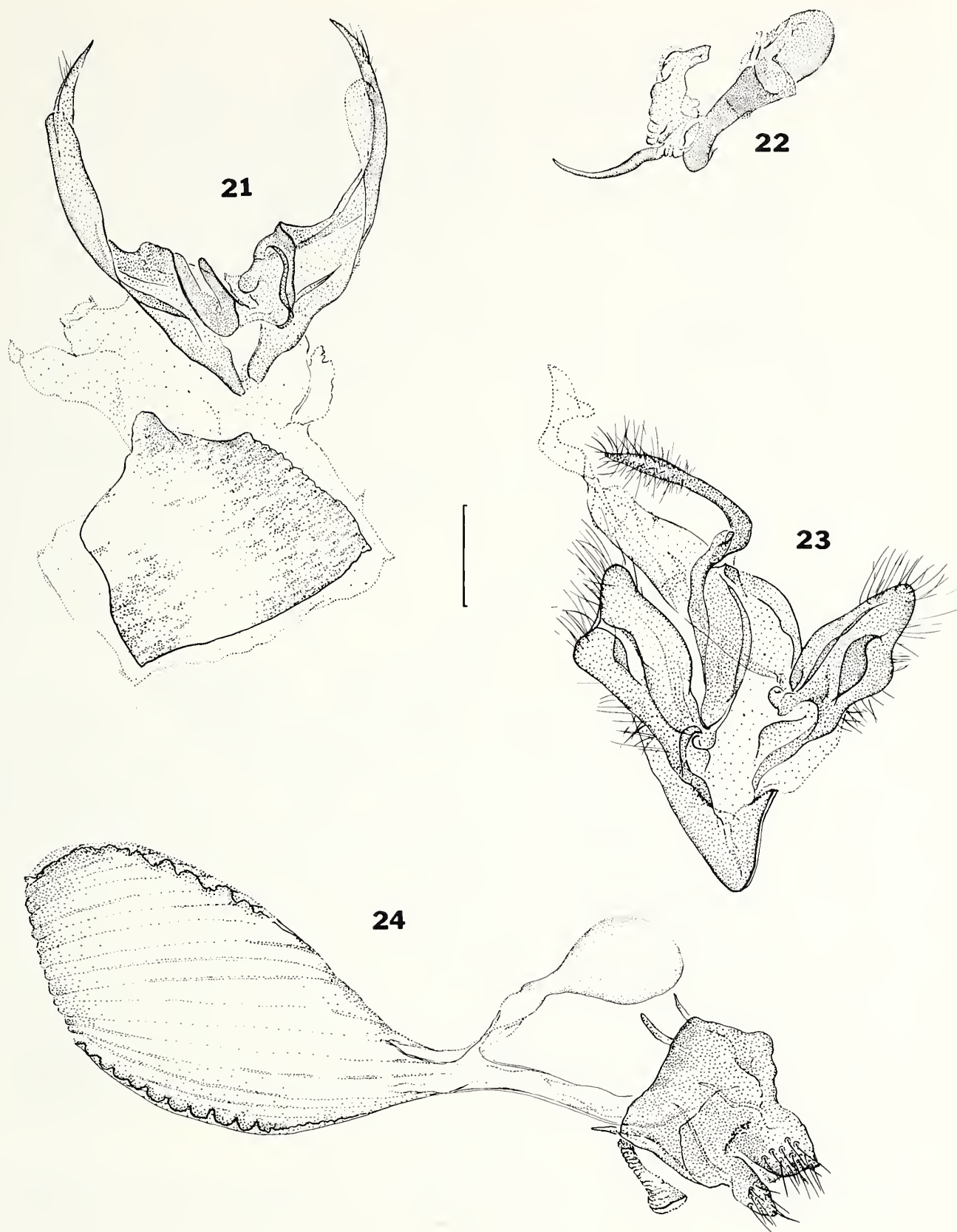
Figs. 13–16. *Hypsoropha adeona*. 13. Seventh and eighth abdominal sterna, McCabe slide 1515, Guanacaste, Costa Rica. 14. Female genitalia (ventral view), McCabe slide 1514, Veracruz, Mexico. 15. Male genitalia, same data as Figure 13. 16. Aedeagus with vesica everted, same data as Figure 13. Scale line 1 mm.



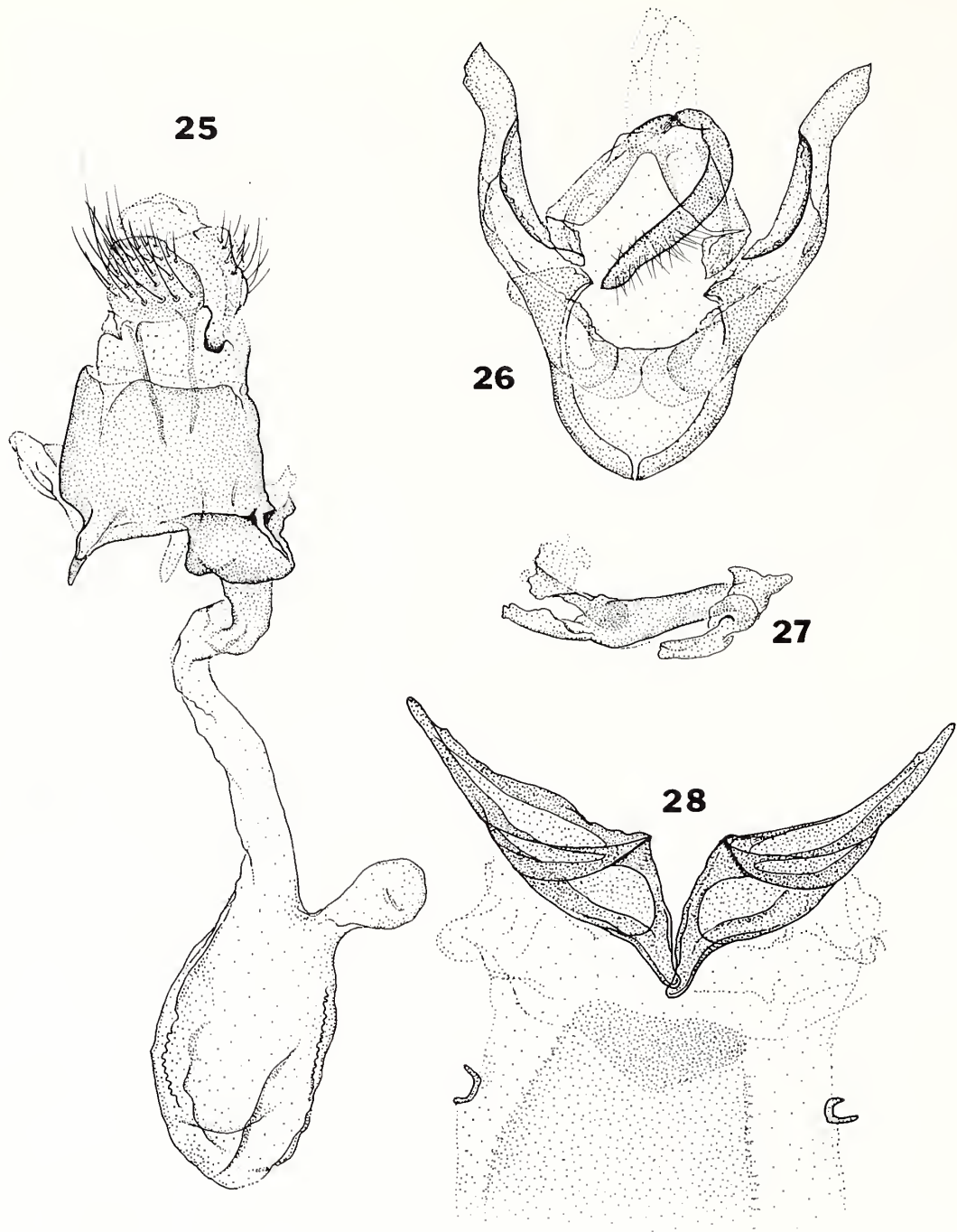
Figs. 17–20. *Hypsoropha monilis*. 17. Seventh and eighth abdominal sterna, McCabe slide 1513, Alachua Co., Florida, 28 March 1986. 18. Male genitalia, same data as Figure 17. 19. Aedoeagus with vesica everted, same data as Figure 17. 20. Female genitalia (ventral view), McCabe slide 1405, Alachua Co., Florida, 30 March 1986. Scale line 1 mm.

Baja and Arizona. *Diospyros californica* (Brandege) I. M. Jhtn. has been reported in the Baja (Wiggins, 1980) and may prove to be an acceptable food plant for this new species.

Type material. **MEXICO, Holotype male:** Baja Calif. Sur Cabo Pulmo, sea level, 10–11 September 1984, J. P. & K. E. Donahue [LACM]. **Paratypes, 10: MEXICO:** same data as holotype [5 specimens—LACM, NYSM]; Mexico: Baja Ca Sur, 12 mi S P. Colorada, Arroyo Las Barracae, 15–18 Oct 1989, N. Bloomfield [1-LACM]; Mexico: Colima, 13 mi N Manzanillo, nicr. Toro 24–26 May 1989 N. Bloomfield [1-LACM] Aguaje, Sinaloa, Mex., VI-18 1956, R. P. Allen [1-CAS]; Baja Calif., San



Figs. 21–24. *Hypsoropha hormos*. 21. Seventh and eighth abdominal sternites, McCabe slide 1491, Alachua Co., Florida, 3 April 1986. 22. Aedoeagus with vesica everted, same data as Figure 21. 23. Male genitalia, same data as Figure 21. 24. Female genitalia (dorsal view), McCabe slide 1404, Alachua Co., Florida, 27 March 1986. Scale line 1 mm.



Figs. 25–28. *Hypsoropha baja*. 25. Female genitalia (ventral view), McCabe slide 1769, Baja, California, 24 July 1981. 26. Male genitalia, McCabe slide 1787, Baja, California, 24 July 1981. 27. Aedoeagus, same data as Figure 26. 28. Seventh and eighth abdominal sternites, same data as Figure 26.

Bartola Microwave Tower, 2000 ft., July 24, 1981, R. Holland [1-AMNH]. UNITED STATES: Arizona: August 22, 1954, Madera Canyon, Santa Rita Mts., Southern Arizona, Lloyd M. Martin [1-LACM].

Hypsoropha adeona Druce
Figs. 3–4, 13–16

Hypsoropha adeona Druce, 1889:338, pl. 30, fig. 28.
Hypsoropha adeona; Poole, 1989:546.

Table 1. Character states.

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1. Male eighth sternum: narrow (0), flattened (1); expanded (2).
 2. Male eighth sternum with supporting struts: absent (0); present (1).
 3. Male antennae: heavily pectinate (0); subpectinate (1).
 4. Valves with fold: central (0); marginal (1).
 5. Male eighth sternum with teeth: absent (0); present (1).
 6. Pm line: straight (0); indented (1).
 7. Forewing white markings: absent (0); present (1).
 8. Saccus a "V" (0); a "U" (1).
 9. Female ductus bullae broad and chitinized (1) or not (0).
 10. Female bursal bands/signa: two bands (0); one band (1); one signum (2).
 11. Female appendix bursae: absent (0); weakly developed (1); well developed (2).
 12. Female with mid-ventral chitinized pocket between ovipositor lobes: absent (0); present (1).
 13. Eight sternite directed: posteriorly (0); anteriorly (1).
 14. Aedoeagus a narrow, curved tube (0) or broad and straight (1).
 15. Uncus: simple (0); slightly modified (1); keel-shaped (2).
 16. Cucullus: absent (0); present (1).
 17. Forewing with circular markings: absent (0); present (1).
 18. Postmedian line: broken (0); entire (1).
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Description. Antenna subpectinate in male, simple in female; palpus upturned beyond vertex in both sexes; head, tegula and thorax buff with yellowish tint; forewing with even, oblique postmedian line starting as four white markings in fold and terminating at costa near apex; antemedian line, when traceable, bowed out opposite cell; reniform obscure, orbicular a black blotch; wings yellow-brown and heavily mottled; hindwing with basal two thirds yellow, gradually darkening toward margin; fringe brown. Male genitalia and eighth sternum as in Figures 15 and 13. Female genitalia as in Figure 14. Expanse 35–40 mm.

Diagnosis. Both *H. adeona* and *H. franclemonti* possess the even, oblique postmedian lines, but *H. franclemonti* has a buff-gray hindwing (see diagnosis under *H. franclemonti*). The moth occurs from Mexico to Costa Rica and the food plant is unknown.

Type locality. Mexico [Veracruz], Jalapa [BMNH].

Hypsoropha monilis (Fabricius)

Figs. 7, 17–20

Noctua monilis Fabricius, 1777:283.

Hypsoropha monilis; Hübner, 1816:249; *Hypsoropha monilis*; Walker, 1857:994; *Hypsoropha monilis*; Dyar, 1903:219; *Hypsoropha monilis*; McDunnough, 1938:125; *Hypsoropha monilis*; Franclemont and Todd, 1983:123; *Hypsoropha monilis*; Poole, 1989:546.

Description. Antenna pectinate in male, simple in female; palpus upturned beyond vertex in both sexes; head, tegula and thorax orange-brown; forewing with postmedian

Table 2. Character matrix.

Taxa	Characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>H. adeona</i>	2	1	1	1	1	0	1	0	0	0	2	1	1	0	1	1	1	0
<i>H. baja</i>	2	1	1	1	0	0	1	0	1	0	2	1	1	0	0	1	1	0
<i>H. franclemonti</i>	2	1	0	0	1	0	1	1	0	1	2	0	1	1	0	0	1	0
<i>H. hormos</i>	1	0	0	0	0	1	1	1	0	0	2	1	1	1	0	0	1	1
<i>H. monilis</i>	1	0	0	1	0	1	1	1	1	2	1	0	1	0	2	0	1	1
<i>P. natadoides</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

line indented below reniform, starting as four white markings in fold and terminating at costa near apex; antemedian line rather evenly excurved when traceable; reniform obscure, orbicular a black point; wings orange-brown; hindwing orange-brown, slightly darker toward margin; fringe concolorous with ground. Male genitalia and eighth sternum as in Figures 18 and 17. Female genitalia as in Figure 20. Expanse 33–44 mm.

Diagnosis. *H. monilis* is distinguished from *H. adeona* and *H. franclemonti* by the indented postmedian line. A spade-shaped juxta represents an autapomorphy for *H. monilis*. The species occurs from northern Florida north to North Carolina, Illinois, and Missouri (Forbes, 1954). The larva feeds on *Diospyros virginiana* and has been described by Dyar (1903a). The head has a conspicuous, rounded, black spot which extends from the posterior margin to along the adfrontals for half their length. The dorsum is black with a pale middorsal stripe, then a subdorsal pale stripe, this followed by a black stripe (Fig. 29). *H. monilis* larvae are sawfly mimics, but spend the daytime hidden at the base of the tree, and large numbers of larvae climb at dusk onto usually one or two limbs (D. F. Schweitzer, pers. comm.). The larva diapaused as a prepupa in a weak cocoon.

Type locality. "Anglia" [in error for North America]. The type has not been located, but it was illustrated by Westwood (1854) on plate 54, figure 61b (plate labelled "doubtful British species").

Hypsoropha hormos Hübner

Figs. 8, 21–24

Hypsoropha hormos Hübner, 1818:10, figs. 27, 28.

Monogona hormos: Gueneé, in Boisduval and Gueneé, 1852:402.

Tiauspa hormos; Walker, 1857:995.

Hypsoropha hormos; Dyar, 1903b:219; *Hypsoropha hormos*; McDunnough, 1938:125; *Hypsoropha hormos*; Franclemont and Todd, 1983:123; *Hypsoropha hormos*; Poole, 1989:546.

Description. Antenna pectinate in male, simple in female; palpus upturned beyond vertex in both sexes; head, tegula and thorax pearl-gray; forewing with postmedian line indented below reniform, starting as four white markings in fold and terminating at costa near apex; antemedian line bowed out at middle; reniform obscure, orbicular a black point; wings pearl gray with black scaling along postmedian line; median area



Fig. 29. Last instar larva of *Hypsoropha hormos*, Bear Swamp East, Cumberland Co., New Jersey (shown on leaf of *Diospyros virginiana*).

and apex lighter gray; hindwing uniform gray-buff gradually darkening toward margin; fringe concolorous with ground. Male genitalia and eighth sternum as in Figures 23 and 21. Female genitalia as in Figure 24. Expanse 22–32 mm.

Diagnosis. *H. hormos* is readily distinguished from *H. adeona* and *H. franclemonti* by the indented postmedian line; from *H. monilis* by the gray color and black scaling along the postmedian line and much smaller size. A pointed male eighth sternum represents an autapomorphy for *H. hormos*. The species occurs from the Florida Keys west to Arizona (Forbes, 1954) and north as far as New Hampshire and New York (Crumb, 1956). The larva was described and the food plant, *Diospyros*, was recorded by Crumb (1956). The larva has a reticulate head pattern. A green and a brown color phase occur; the green phase has purplish spots subdorsally, these being fused on segment five and eight. The mandible has a mesal tooth. Adults show much more brown overall in the northern parts of their range.

Type locality. Georgia [type deposition unknown].

PHYLOGENETIC ANALYSIS

Polarization of character states was accomplished by outgroup comparison with *Psammotherodoxa natadoides* Franclemont, which has been recognized as a near relative of *Hypsoropha* (Franclemont, 1985). The Hennig 86 computer program (Farris, 1988) was employed. The cladogram in Figure 30 is the most parsimonious tree possible for the data presented. The tree exhibited a consistency of 0.786.

Not immediately evident from the bi- and tri-state partitioning of characters is a

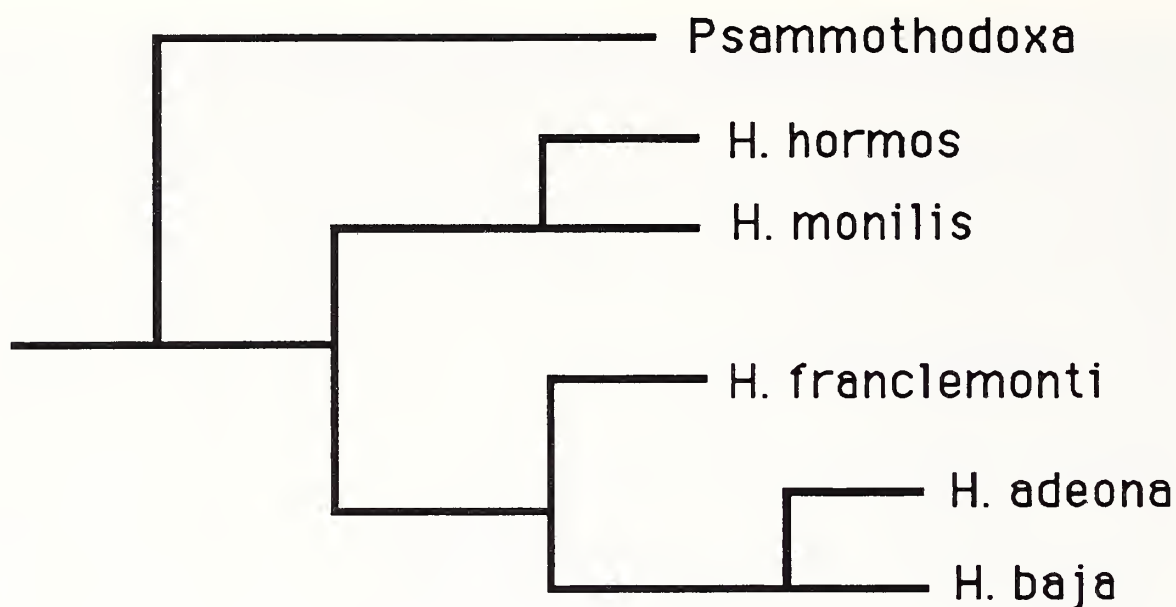


Fig. 30. Cladogram.

phyletic series: the eighth abdominal sternite in the male progresses from a simple, thin, modified pincer in *H. hormos*, to a slightly heavier pincer in *H. monilis*, to an even heavier and expanded pincer in *H. franclemonti* and *H. baja* and finally to a very heavy, expanded structure in *H. adeona*. *Hypsoropha hormos*, which has the largest known distribution, is hypothesized to be the least derived species in the genus.

ACKNOWLEDGMENTS

I thank John Franclemont of Cornell University, Robert Poole of the United State National Museum, James Miller of the American Museum of Natural History, Julian Donahue of the Los Angeles County Museum, Paul Arnaud and Norman Penny of the California Academy of Science, S. Morton Adams of West Shokan, John Rawlins of the Carnegie Museum, and Martin Honey of the British Museum (Natural History) for searching for Caribbean, Middle and North American specimens for me. I am also indebted to Ole Karsholt of the Zoologisk Museum, Glasgow, who kindly searched for *Hypsoropha* and confirmed that the type of *H. monilis* was not deposited in that museum and who sent related genera collected in Argentina. Mr. Sidney Russell, on behalf of the Bahamian government, granted permission to collect on Exuma Island. Christopher Supkis printed the photographs. Patricia Kernan provided the illustrations. Dale Schweitzer kindly sent me immatures of *H. monilis* and gave his observations on their habits. Contribution number 656 of the New York State Science Service.

LITERATURE CITED

- Berio, E. 1957. Ulteriori modifiche e Cambiamenti nella nomenclatura dei generi di noctuidae del globo. *Memorie Soc. Entomol. Ital.* 36:14.
- Butler, A. G. 1879. On the Lepidoptera of the Amazons, collected by Dr. James W. H. Trail, during the years 1873 to 1875. Part III.—Noctuities. *Trans. Entomol. Soc. Lond.* 1879: 160–166.
- Correll, D. S. and H. B. Correll. 1982. *Flora of the Bahama Archipelago*. J. Cramer, Vaduz, 1692 pp.

- Crumb, S. E. 1956. The larvae of the Phalaenidae. U.S. Dept. Agric. Tech. Bull. 1135, 356 pp.
- Druce, H. 1889. Heterocera. *In* Godman and Salvin, *Biologia Centrali Americana*. Insecta. Taylor and Francis, London. P. 338, Pl. 30, Fig. 28.
- Dyar, H. G. 1899. Life history of *Hypsoropha hormos*, Hübn. *Can. Entomol.* 31:289–290.
- Dyar, H. G. 1903a. New North American Lepidoptera with notes on larvae. *Proc. Wash. Entomol. Soc.* 5:291.
- Dyar, H. G. 1903b. A list of North American Lepidoptera and key to the literature of this order of insects. Government Printing Office, Washington, D.C., 723 pp.
- Fabricius, J. C. [1777]. *Genera Insectorum*. M. F. Bartschii, Chilonii [Kiel], p. 283.
- Farris, J. S. 1988. Hennig 86 (a phylogenetic computer program), version 1.5. Stony Brook, N.Y.
- Forbes, W. T. M. 1954. Lepidoptera of New York and neighboring states. *Cornell Expt. Sta. Mem.* 329, 433 pp.
- Franclemont, J. G. 1985. A new species of *Psammathodoxa* Dyar from Costa Rica (Lepidoptera: Noctuidae: Catocalinae). *Proc. Entomol. Soc. Wash.* 87(4):746–750.
- Franclemont, J. G. and E. L. Todd. 1983. Noctuidae, pp. 120–159. *In*: R. W. Hodges et al. (eds.), 1983 Check List of the Lepidoptera of America North of Mexico. E. W. Classey Limited and the Wedge Entomological Research Foundation, London, 284 pp.
- Glover, T. 1878. Illustrations of North American Entomology. J. S. Tomlinson, Washington, D.C., plate 13, figs. 1 & 2.
- Grote, 1874. List of the Noctuidae of North America. *Bull. Buffalo Soc. Nat. Sci.* 2:29.
- Gueneé, A. 1852. *In* J. B. A. D. de Boisduval & A. Gueneé, *Histoire Naturelle des Insectes. Species General des Lepidopteres*. Roret, Paris, Pt. 6, p.402.
- Hübner, J. 1808. Sammlung exotischer Schmetterlinge. Augsburg 1:14, figs. 27, 28.
- Hübner, J. 1816. Verzeichniss bekannter Schmetterlinge. Augsburg P. 249.
- Hübner, J. 1818. Zuträge zur Sammlung exotischer Schmetterlinge. Augsburg 1:10.
- McDunnough, J. 1938. Checklist of the Lepidoptera of Canada and the United States of America. Part 1, Macrolepidoptera. *Mem. S. Calif. Acad. Sci.* 1:1–272.
- Neave, S. A. 1939. *Nomenclator Zoologicus*. 2:477. Richard Clay & Co., Ltd., Suffolk, England.
- Poole, R. W. 1989. *Lepidopterorum Catalogus* (N.S.). Fascicle 118. Noctuidae (3 parts). E. J. Brill/Flora & Fauna Publications, New York, 1314 pp.
- Schaus, W. 1901. A revision of the American Notodontidae. *Trans. Entomol. Soc. London* 1901:272.
- Walker, F. [1858] 1857. List of the Specimens of Lepidopterous Insects in the Collection of the British Museum. E. Newman, London. Vol. 13, p. 984, 995.
- Westwood, J. O. 1854. *Wood's Index Entomologicus; or, a complete illustrated catalogue, consisting of upwards of two thousand accurately coloured figures of the Lepidopterous insects of Great Britain. A new and revised edition, with supplement, containing figures and notices of nearly two hundred newly discovered species, synoptic lists, etc.* London. G. Willis, Great Piazza, Covent Garden. Pp. 298.
- Wiggins, I. 1980. *Flora of Baja California*. Stanford University Press, Stanford, California, 1025 pp.

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